	Application No.	Applicant(s)
Notice of Allowability	10/074,616	GAI ET AL.
	Examiner	Art Unit	
	Marc R. Filipczyk	2163	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *1/5/07*.

2. ☒ The allowed claim(s) is/are *1-5,7,9-12,21,26-36,38,39 and 41-51*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some*   c) ☐ None   of the:

        1. ☐ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
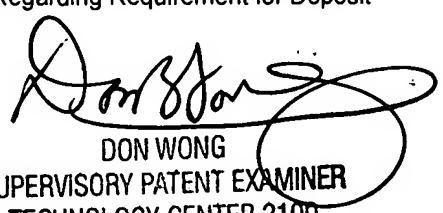
    * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____ .

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

    Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application

6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____ .

DON WONG
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

Response to Amendment

This Action is responsive to Applicant's amendment filed on January 5, 2007. Claims

1-7, 9-12, 21-41 and new claims 42-51 are now pending.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or

additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR

1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the

payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with

James Blanchette on March 1, 2007.

AMENDMENT TO CLAIMS

1. (CURRENTLY AMENDED) A method for operating a pattern matching engine having a

plurality of information storage entries with two or more regular expressions, each regular

expression including a plurality of characters and each regular expression associated with a

corresponding action to be applied when matching strings are found, the method comprising the

steps of:

identifying one or more borders within each regular expression, the one or more borders

separating the regular expression into a plurality of sub-expressions, each sub-expression having

a plurality of sequential characters;

loading each entry of the a plurality of entries of the pattern matching engine with the

plurality of the sequential characters from one of the sub-expressions of the plurality of sub-

expressions, wherein the borders are defined by a predetermined sequence of regular expression metacharacters, and the entries stored in content addressable memory (CAM);

applying a string from a network message to the entries of the pattern matching engine to search the string simultaneously in parallel for sub-expressions from each of the two or more regular expressions;

determining that the sub-expressions of at least one regular expression match the string; and

executing the corresponding action associated with that at least one regular expression on the network message.

6. (CANCELLED)

7. (CURRENTLY AMENDED) The method of claim 6 1 wherein

the CAM is a ternary content addressable memory, a TCAM, that supports don't care values, and

each regular expressions loaded to the CAM has a plurality of search patterns including a mismatch pattern having don't care values.

22-25. (CANCELLED)

26. (CURRENTLY AMENDED) An apparatus comprising:

means for pattern matching having a plurality of information storage entries with two or more regular expressions, each regular expression including a plurality of characters and each regular expression associated with a corresponding action to be applied when matching strings are found;

means for identifying one or more borders within each regular expression, the one or more borders separating the regular expression into a plurality of sub-expressions, each sub-expression having a plurality of sequential characters;

means for loading each entry of a the plurality of entries of the means for pattern matching with the plurality of the sequential characters from one of the sub-expressions of the plurality of sub-expressions, the entries stored in content addressable memory (CAM);

means for applying a string from a network message to the entries of the pattern matching engine to search the string simultaneously in parallel for sub-expressions from each of the two or more regular expressions;

means for determining in parallel that the sub-expressions of each at least one regular expression matches match the a string within a network message; and

means for executing the corresponding action associated with that at least one the regular expression expressions on the network message.

31. (CURRENTLY AMENDED) An apparatus comprising:

a pattern matching engine having a plurality of information storage entries configured to store two or more regular expressions, each regular expression including a plurality of characters and associated with a corresponding action to be applied to a network message, the pattern matching engine configured to identify one or more borders within a regular expression, the one or more borders separating the regular expression into a plurality of sub-expressions, each sub-expression having a plurality of sequential characters, each entry of the plurality of entries of the pattern matching engine including the plurality of sequential characters from one of the sub-expressions of the plurality of subexpressions, the pattern matching engine configured to apply a string from a network message to the entries to search the string simultaneously in parallel for sub-expressions from each of the two or more regular expression and to determine that the plurality of sequential characters from the sub-expressions of at least one regular expression match the string, and then to execute the corresponding action actions associated with that at least one regular expression on the network message; and

a content addressable memory (CAM), the CAM configured to store the plurality of sequential characters from the plurality of sub-expressions.

36. (CURRENTLY AMENDED) A method for operating a pattern matching engine comprising the steps of:

obtaining two or more regular expressions;

identifying one or more borders within each regular expression using a deterministic finite state machine, the one or more borders separating the regular expression into a plurality of sub expressions, each sub expression including one or more characters, each border indicated by one or more predetermined metacharacters;

loading separate portions of a memory of the pattern matching engine with the sequential characters from each of the plurality of sub expressions of the two or more regular expressions;

applying a string from a network message to the memory to search the string in parallel for sub expressions from each of the two or more regular expression; and

determining that at least one of the two or more regular expressions matches the string and executing in response thereto a corresponding action associated with that regular expression.;

wherein the memory is a content addressable memory (CAM).

37. (CANCELLED)

38. (CURRENTLY AMENDED) The method of claim 36 wherein the step of loading further comprises the step of:

generating a plurality of search patterns for the sequential characters from each of the plurality of sub expressions and loading these search patterns into the the seperateseparate portions of the memory.

39. (CURRENTLY AMENDED) An apparatus comprising:

a pattern matching engine configured to obtain two or more regular expressions and to identify one or more borders within each regular expression using a deterministic finite state machine, the one or more borders separating the regular expression into a plurality of sub expressions, each sub expression including one or more characters, each border indicated by one or more predetermined metacharacters;

a memory of the pattern matching engine configured to store the sequential characters from each of the plurality of sub expressions of the two or more regular expressions in separate portions of memory, the memory further configured to, in response to application of a string from a network message, search the string in parallel for sub expressions from each of the two or more regular expression, and to determine that at least one of the two or more regular expressions matches the string; and

the pattern matching engine further configured to cause the execution of a corresponding action associated with that regular expression that matches;

wherein the memory is a content addressable memory (CAM).

40. (CANCELLED)

41. (CURRENTLY AMENDED) The apparatus of claim 39 wherein the memory if is further configured to store a plurality of search patterns for the sequential characters of each of the plurality of sub expressions.

49. (CURRENTLY AMENDED) The apparatus of claim 38 39 wherein the deterministic finite state machine is configured to transition between states in response to valid character matches with parsed characters of regular expressions.

Allowable Subject Matter

Claims 1-5, 7, 9-12, 21, 26-36, 38, 39 and 41-51 are allowable over the prior art of record, renumbered as claims 1-35, respectively.

The following is an Examiner's statement of reasons for allowance:

Claims 1, 26, 31, 36 and 39 are allowable because the prior art of record or that was encountered in searching for the invention, fails to disclose or suggest a means for pattern

searching or a pattern searching engine that searches for a string in parallel for sub-expressions

from regular expressions and executing a corresponding action associated with a particular

regular expression comprising a content addressable memory (CAM), as claimed in addition to

the other claim provisions.

Claims 2-5, 7, 9-12, 21, 27-35, 38 and 41-51 depend from claims 1, 26, 31, 36 and 39 and

are therefore allowable for the same reasons.

The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure. The following shows the state of art with respect to pattern matching:

U.S. Patent No. 5,692,174 of Bireley et al.

U.S. Patent No. 6,768,992 of Jolitz.

Any comments considered necessary by applicant must be submitted no later than the

payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for
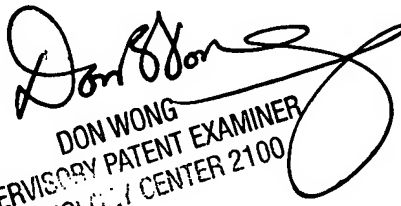
Allowance."

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Marc R. Filipczyk whose telephone number is (571) 272-4019.

The examiner can normally be reached on Mon-Fri, 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Don Wong can be reached on 571-272-1834. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MF
March 2, 2007

DON WONG
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100